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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,059	12/30/2003	Hiroshi Miyazaki	TI-36833	9129

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EXAMINER
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LE, THAO X

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 02/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/750,059

Applicant(s)

MIYAZAKI, HIROSHI

Examiner

Thao X. Le

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 22-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/30/03</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-21, drawn to a semiconductor device, classified in class 257, subclass 737-738 and 779-784.
  - II. Claims 22-27, drawn to a method of making a semiconductor device, classified in class 438, subclass 612-613.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions Group I and Group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process. For instant the insulative mask can be formed on a carrying substrate, laminated on the device substrate, then remove the carrying substrate.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with the Applicant's attorney, Mr. Yingsheng Tung on 02/03/05 a provisional election was made WITHOUT traverse to prosecute the

invention of group I, claims 1-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 22-27 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-4, 9-15, 19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pub. 2003/0047339 to Lutz.

Regarding claim 1, Lutz discloses in fig. 2E an interconnect structure for receiving a solder contact comprising: a substrate 102 [0072], a contact pad 200/240 [0071] disposed over a surface of the substrate 102, an inner portion of the contact pad 200/240 including a compliant layer 220 [0079] and a conductive layer 240 [0095] that is disposed over the compliant layer 220, and an insulative mask 108 [0088], disposed over the contact pad 200/240, the insulative mask including an opening that is aligned over and that exposes the inner portion (compliant layer), the inner portion of the contact pad having sufficient flexibility to distribute mechanical stress applied to the contact pad [0084].

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Regarding claims 2, 14, Lutz discloses the interconnect structure wherein the compliant layer 220 being formed from a compliant material that has an elastic modulus lower than the elastic modulus of the material used to form the conductive layer 240.

Although the prior art does not specially disclose the layer 220 has an elastic modulus lower than the elastic modulus of the material used to form the conductive layer 240, this feature is seen to be inherently teaching of that limitation, because the metal layer 240 comprises copper, silver, platinum, nickel, or alloy [0095] would have higher elastic modulus than the plastic compliant layer 220 [0081].

Regarding claim 3, Lutz discloses the interconnect structure wherein the conductive layer 240 comprising a conductive metal [0095], and the compliant layer 140 comprising at least one of a metal, a non-metal, a ceramic, and a composite [0081].

Regarding claims 4, 15, Lutz discloses the interconnect structure of claim 1, the conductive layer 240 comprising copper [0095], and the compliant layer 220 comprising a compliant material having an elastic modulus lower than the elastic modulus of copper.

Although the prior art does not specially disclose the compliant layer 220 has an elastic modulus lower than the elastic modulus of the copper conductive layer 240, this feature is seen to be inherently teaching of that limitation, because the metal layer 240 comprises copper [0095] would have higher elastic modulus than the plastic compliant layer 220.

Regarding claim 9, Fjelstad discloses the interconnect structure wherein the opening 230, fig. 2D, exposing a substantially planar contact surface.

Regarding claim 10, Fjelstad discloses the interconnect structure of claim 1 further including a solder contact 610 [0155], attached to the contact surface, the solder contact including a contact portion 240 defined by the opening of the insulative mask 108, fig. 6D.

Regarding claim 11-12, 19-21, Lutz discloses the interconnect structure wherein the contact surface including at least one protrusion 240, fig. 2E, that extends within the opening 230 from the contact surface, the protrusion being defined by the conductive layer 240 of the inner portion, the protrusion substantially improving shear and attach yield of the solder contact to the contact pad.

The recitation of 'protrusion substantially improving shear and attach yield of the solder contact to the contact pad' is only a statement of the inherent properties of the product. The structure recited in Lutz is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Regarding claim 13, Lutz discloses an interconnect structure for receiving a solder contact comprising: a substrate 102, contact pad 200/240 disposed over a surface of the substrate 102, the contact pad including an inner portion and an outer portion, the inner portion of the contact pad including a compliant layer 220 and a conductive layer 240 that is disposed over the compliant layer 220; and an insulative mask 108 disposed over the contact pad 200/240, the insulative mask 108 including an

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opening 230 that is aligned over and that exposes a contact surface of the contact pad, the contact surface being defined by the inner portion and part of the outer portion, fig.

2E.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 5-6, 16, are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pub. 2003/0047339 to Lutz in view of US 6211572 to Fjelstad et al.

Regarding claims 5-6, 16, Lutz discloses the interconnect structure wherein the compliant layer 220 being more flexible than the conductive layer 240.

But Lutz does not disclose the interconnect structure wherein the compliant layer being formed from a compliant material that has an elastic modulus higher than the elastic modulus of the material used to form the conductive layer and comprising at least one of pores (foam), apertures, and voids to provide the compliant layer with a flexibility greater than the conductive layer.

However, Fjelstad discloses the interconnect structure in fig. 1F wherein the compliant layer 240 being formed from a compliant material that has an elastic modulus higher than the elastic modulus of the material used to form the

conductive layer, column 6 lines 39-40, and comprising at least one of pores (foam), apertures, and voids to provide the compliant layer with a flexibility greater than the conductive layer, column 6 line 34-45. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the compliant layer teaching of Fjelstad with Lutz's device, because using such material configuration would have resulted in a flexible material as taught by Fjelstad, column 6 line 35-45.

9. Claims 7-8, 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pub. 2003/0047339 to Lutz in view of US 5666270 to Matsuda et al.

Regarding claims 7-8, 17-18, Lutz discloses the interconnect structure wherein the contact pad further including an outer portion, the outer portion 240 comprising at least one conductive layer 240 [0095].

But Lutz does not disclose the at least one conductive layer 240 of the outer portion having a thickness substantially greater than the thickness of the conductive layer of the inner portion, and the conductive layer of the inner portion being substantially more flexible than the at least one conductive layer of the outer portion.

However, Matsuda discloses a interconnect structure in fig. 7F comprises a compliant layer 35, at least one conductive layer 36 of the outer portion having a thickness substantially greater than the thickness of the conductive layer of the inner portion (middle portion or where t2 is located), fig. 7E, and the conductive layer of the inner portion being substantially more flexible than the at least one



conductive layer of the outer portion. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the contact pad teaching of Matsuda with Lutz's device, because it would have prevented the stress being applied to the semiconductor element as taught by Matsuda, column 5 lines 1-7.

With respect to 'the conductive layer of the inner portion being substantially more flexible than the at least one conductive layer of the outer portion', this feature is obvious because the thinner middle portion of layer 36 would be more flexible than the thicker portion of layer 36.

### ***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, consisting of a stylized 'T' followed by a horizontal line and a vertical stroke.

Thao X. Le  
Patent Examiner  
04 Feb. 2005